small as possible by absorbing kinetic energy during a maximum period, and giving it out during the minimum period which immediately follows.

With fly-wheels of practicable size, some cyclical speed variation, of course, is inevitable, and the range depends upon the ratio of the total work stored in the fly-wheel, in the form of kinetic energy, to the work taken in and given out during the greatest maximum or minimum periods respectively. The algebraical sum of the energies taken in and given out; is, of course, zero. At the end of a minimum period the speed is at its lowest. It is then accelerated and passes through the mean speed to the highest, and goes through these changes in the reverse order during the ensuing minimum

y Y.

period. The ratio of the variation to the mean speed, or 2 f -1, is

^o]

called the coefficient of fluctuation of speed, and is usually denoted by . This varies from .jjb to ,100 for electrical generating purposes. I

It is computed as follows when the weight of the fly-wheel rim is known.

Let W Ib. denote the weight of rim, V_2 and V_l the higher and lower speeds respectively, and V_0 the mean speed in feet per second. Let the excess energy, as obtained from the turning moment diagram, be

AK .- ^ VJW.

2tf

but *VJ-Vf* =-, (V_a ~|-V_x) (V_8 - VJ,

and VS + Y! = *2* V_0 ;

... AE ,., (V., - VJ_V_0W

A'

and V_2 - Vj -••

V_0

.1 AK

•'• **M** : ' ***zB*** '

WV 2

when E - WVo ,

**R*

the energy in the rim at mean speed.

The weight of the rim is calculated from W = £.AE.M/V_0^2. The energy E in the rim must be computed by taking its weight to act at the radius

/y~~2'"_L."*• 2

of gyration *r* = -y JLJILJL* The energy contained in the

web is usually
2
neglected in this calculation, so that there is no great error in taking *r* as the mean of the external and internal radii.

In compound engines with two cranks the ratio of the excess work to the work done during one revolution is 14 per cent to 15 per cent and in triple-expansion engines it is 8 per cent to 9 per cent. It would seem, then, that in the case of the latter, the fly-wheels might be comparatively lighter; but one of the functions of a fly-wheel is to keep within limits the momentary rise in speed which would occur should the